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[54] **EYE TRACKING APPARATUS AND METHOD EMPLOYING GRAYSCALE THRESHOLD VALUES**

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[57] **ABSTRACT**

An eye-tracking system determines the position of a user's pupil and maps this position into a point of regard of the user on an interface device, such as a display screen, or other real-world object by a system comprising a camera for acquiring a video image of the pupil; a frame grabber coupled to the camera for accepting and converting analog video data from the camera to digital pixel data; a computer coupled to the frame grabber for processing the digital pixel data to substantially determine the position of the pupil; a display screen coupled to the computer; and a support connected to the camera and display screen for fixing the relative physical positions thereof relative to the user's pupil. The processing performed by the computer may include the selection of a first pixel intensity threshold for the segmentation of the digital pixel data into first and second groups, where the total pixel area of the first group is selected to be substantially equal to a pre-determined value expected to correspond to the area of a user's pupil. The system may be calibrated by the user's following a cursor on the display screen while the system measures the pupil position for known locations of the cursor.

35 Claims, 16 Drawing Sheets